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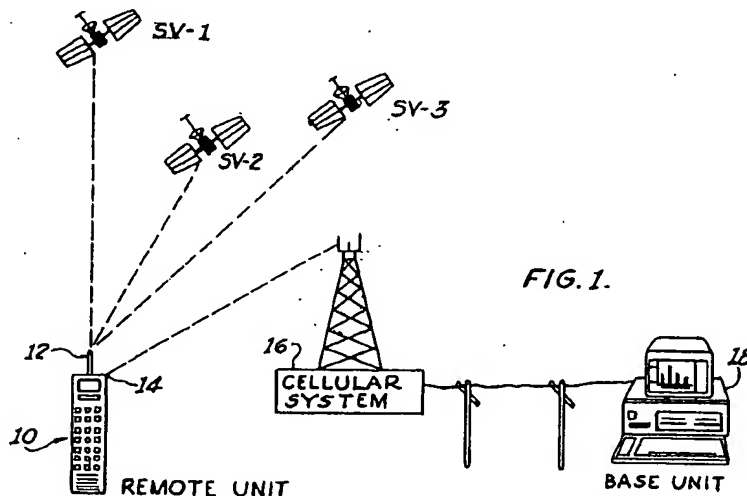
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## (54) Cellular position locating system.

(57) The invention comprises a portable locating unit (10) useful both as a cellular telephone and portable global positioning system that provides latitude and longitude information remotely to a base unit display (18). The system includes a small hand held receiver (10) that receives signals from a satellite global positioning system and timing and computing cir-

cuits to provide location information signals. The hand held unit also includes a modem and transmitter to a cellular telephone network (16) which is connected to the base unit computational system and display (18). The location of an individual or object can thus be determined at the remote station through the use of the cellular telephone network.



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## BACKGROUND OF THE INVENTION

### 1. Field of the Invention

This invention relates to a system for ascertaining the latitude and longitude of an individual or object at a remote location and transmitting information to a base operation using a man-pack or singular portable personnel unit that embodies a cellular telephone network in conjunction with a satellite navigation system, and specifically to a hand-held locating unit that can serve both as a cellular telephone and a portable globular positioning system to provide latitude and longitude information for display at a base unit.

### 2. Description of the Prior Art

The prior art shows a plethora of systems for locating individual vehicles relative to a central station. U.S. Patent 4,701,760, issued to Raoux on October 20, 1987 shows a vehicle monitoring system that uses World Omega Network and a vehicle carried receiver to provide approximate coordinates to a central location. U.S. Patent 4,897,642, issued to DiLulo et al., January 30, 1990, shows a method for monitoring the status of a multiple part vehicle (such as an eighteen wheel truck) and its cargo carrier through the use of satellites and an earth station.

U.S. Patent 3,568,161, issued to Knickel, March 2, 1971 shows a vehicle locator system which employs a plurality of sensor stations and a central station. U.S. Patent 4,791,572, issued to Green et al., December 13, 1988, shows a locating system that uses the LORAN-C system for positioning information. U.S. Patent 4,891,761, issued to Gray, January 2, 1990, shows a system for updating a digitized map comparing known and unknown intersections in conjunction with a navigational tracking unit.

The units described in the prior art are complex in operation and do not utilize available cellular telephone technology. The present invention overcomes problems of the prior art by providing a non-complex portable hand-held unit that has cross country capability and versatility for use as a regular cellular telephone in conjunction with a precise navigational locating system that can be conveniently and easily carried for transmission and display of position information at a base location.

### BRIEF SUMMARY OF THE INVENTION

A global positioning system especially adapted for use by an individual or object that includes a portable remote unit and a base information display unit. The portable remote unit includes an RF receiver circuit for use with a satellite navigation system, a microprocessor for analyzing coded signals, cellular phone modem circuits for transmitting encoded signals to the base unit and a time of day clock. The base unit includes a computational system for decoding position data and a visual display device for presenting the remote unit map coordinates.

The portable remote unit is comprised of four sub-systems which include the global positioning system RF "L" band antenna and receiver that receives signals from a plurality of existing satellites. A microprocessor is used as the computational system that receives the output from a signal demodulator in the GPS receiver. The central timing circuit for accurate time of day has outputs connected to the GPS demodulator and the microprocessor. The GPS receiver generates its own ephemeris data called "Pseudo Random Code" and a code train that matches the satellite code exactly. The Pseudo Random Code is generated at the same time as the satellite codes are received. The received train of pulses from the satellite is, then matched with the Pseudo Random code to provide a time difference between satellite time and the Pseudo Random Code generated time which provides for satellite range. The information is then stored in memory and provided to a cellular telephone modem and transmitter for transmission through the cellular telephone system.

The base unit, which receives and coordinates the locations of various personnel at the remote locations, includes a computation system for decoding the position data transmitted from the remote units through the cellular telephone system. The base unit uses a computer that includes a visual display device showing a map, upon which the decoded position data will be used to show coordinates in latitude and longitude of each remote unit.

The remote unit in one configuration may be a small hand-held unit using battery power that includes a GPS helix antenna for receiving satellite signals and a cellular antenna for transmission of the coded position information to the cellular telephone system. The remote unit could also be configured to use electrical power from a vehicle.

When using the present invention it should be noted that the invention combines an existing global navigational positioning system through the use of satellites, cellular telephone technology, computer and modem interfaces. Thus the hand carried unit is self contained. The remote unit includes a special modem system which could use, in one example, Bell 202A Protocol without the use of a dial tone, in order to transfer position data from computer memory to the cellular phone system. The hand held unit also includes frequency shift

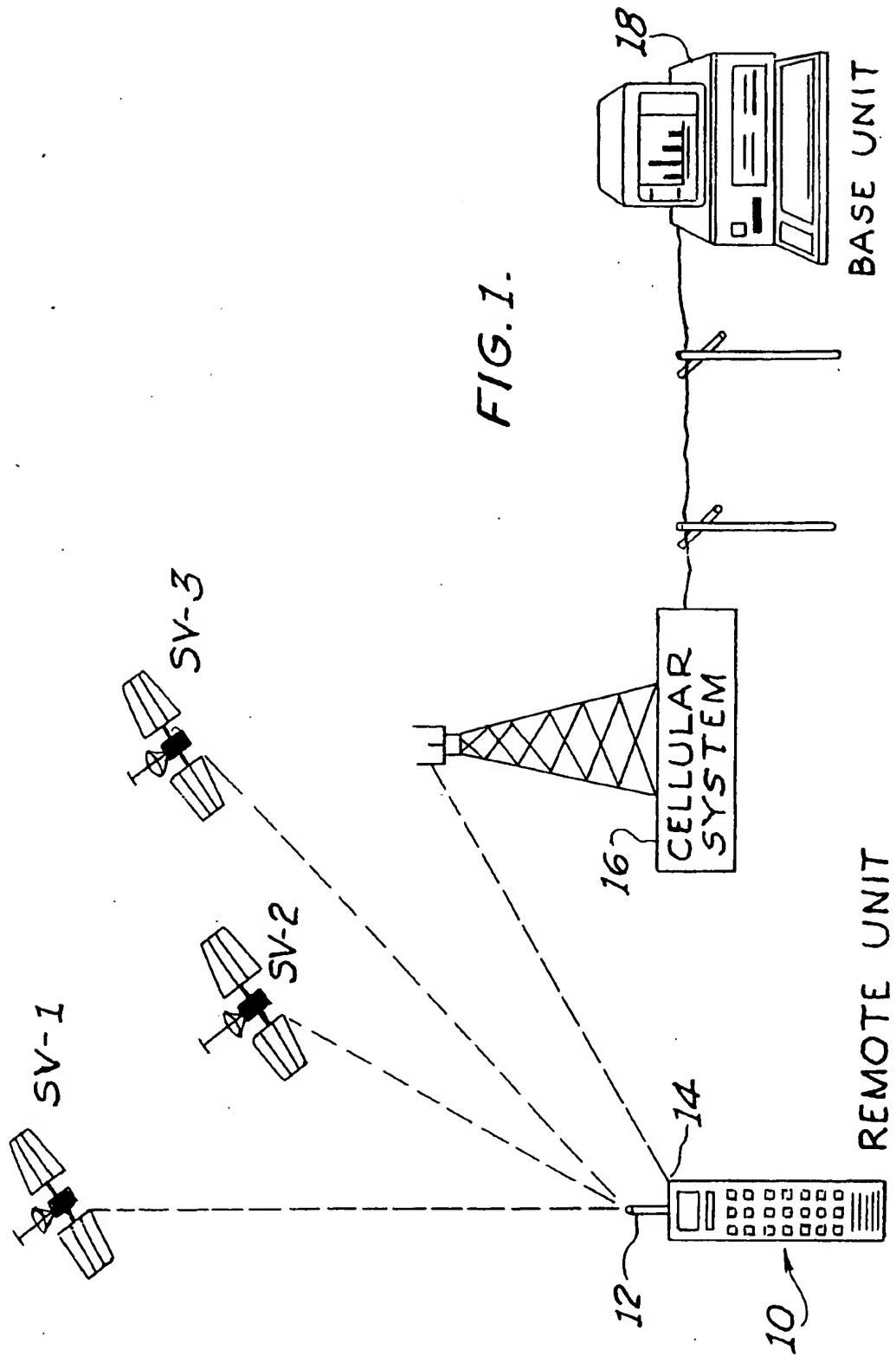
all of which is mounted in a small rectangular housing 52 which could be dimensionally sized to be hand held. The remote unit could also be configured in a vehicle to use vehicle power, and as such, if used for surveillance or military use, the antennas could be hidden.

The invention as described provides for a portable hand carried or vehicle remote unit that allows individuals or objects to be located from a base station anywhere in the world using a non-complex, relatively inexpensive system that employs current cellular phone technology.

The instant invention has been shown and described herein in what it is considered to be the most practical and preferred embodiment. It is recognized, however, that departures may be made therefrom within the scope of the invention and that obvious modifications will occur to a person skilled in the art.

#### Claims

1. A cellular position locating system for locating the geographical coordinates using a portable hand held remote unit comprising:
  - receiver means for receiving navigational signals from satellites in orbit about the earth;
  - signal processing means for demodulating the satellite navigational signals;
  - means for generating a pseudo random code;
  - timing means connected to said demodulating means and said signal processing means;
  - means for generating position information signals by comparing the time difference of the navigational signals and the pseudo random code signals;
  - means for converting position information signals into cellular telephone signals;
  - cellular telephone signal transmitting means;
  - cellular telephone for transmitting signals via cellular telephone into the conventional phone lines;
  - base unit means for processing telephone signals received from said cellular transmitter;
  - said base means including means for decoding the received signal for determining geographic location position data; and
  - a display means connected to said base unit for displaying the geographical coordinate information.
2. A method for locating a person or object at a remote location from a base location comprising the steps of:
  - (a) receiving navigational information signals from a satellite location;
  - (b) generating a pseudo random code at the remote location and comparing it to a known time signal relative to the satellite navigational signals;
  - (c) providing cellular telephone modem signal processing means for transferring the navigational information into a cellular telephone signal;
  - (d) transmitting the navigational signal information to a cellular telephone network;
  - (e) receiving the navigational signal information through a cellular telephone to a central processing unit;
  - (f) means for displaying the signal received at the base unit.
3. A cellular position locating system to provide latitude and longitude information from a remote site to a base site comprising:
  - a portable housing sized to be hand held;
  - portable navigational satellite signal receiving means mounted in said housing;
  - timing means to provide time of day mounted in said housing;
  - signal processing means having an input connected to said navigational satellite signal receiving means and said timing means to provide an output signal representing the geographical location of said satellite signal receiving means;
  - telephone modem means connected to the output of said satellite signal processing means;
  - cellular telephone signal transmitter connected to said modem and mounted in said housing;
  - cellular telephone signal network for receiving and transmitting cellular telephone signals; and
  - a base unit connected to said cellular telephone signal network for receiving cellular telephone signals and for providing a display that represents geographical positions of said navigational satellite signal receiving means.
4. A cellular position locating system as in claim 3, including:
  - a cellular telephone signal receiver mounted in said housing;
  - memory means mounted in said housing and connected to said cellular telephone signal receiver and said signal processing means to provide control to said signal processing means.



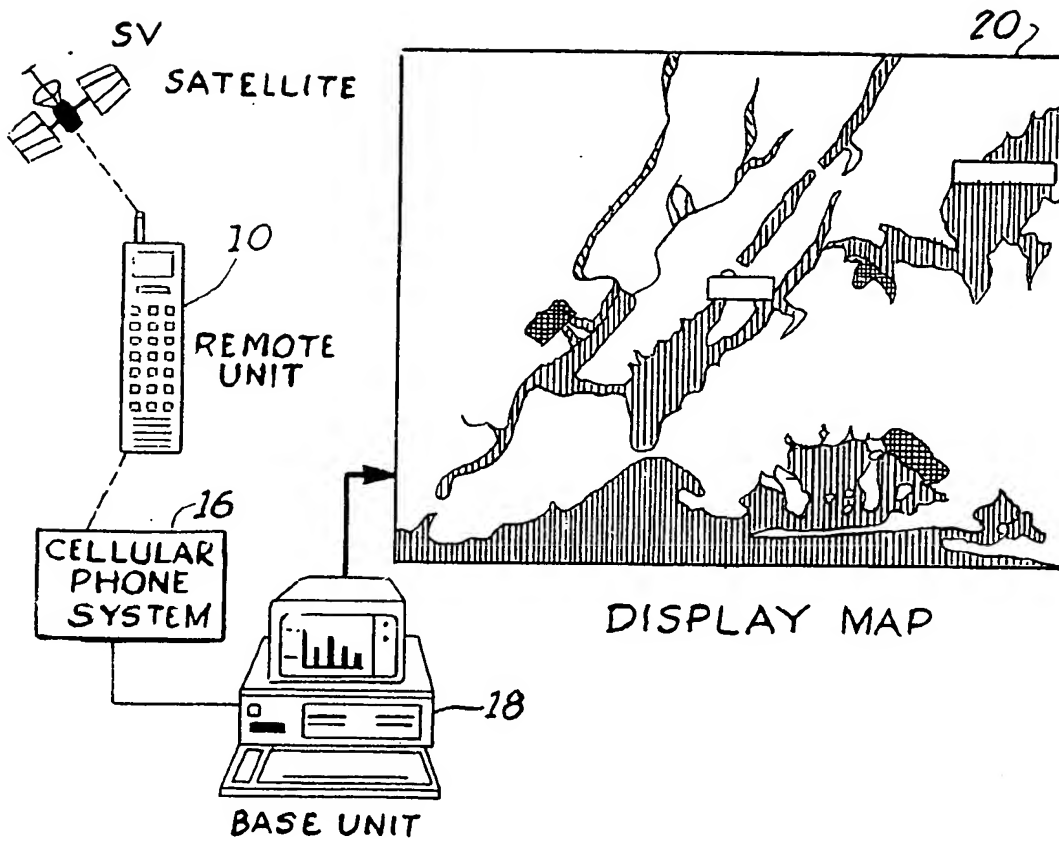
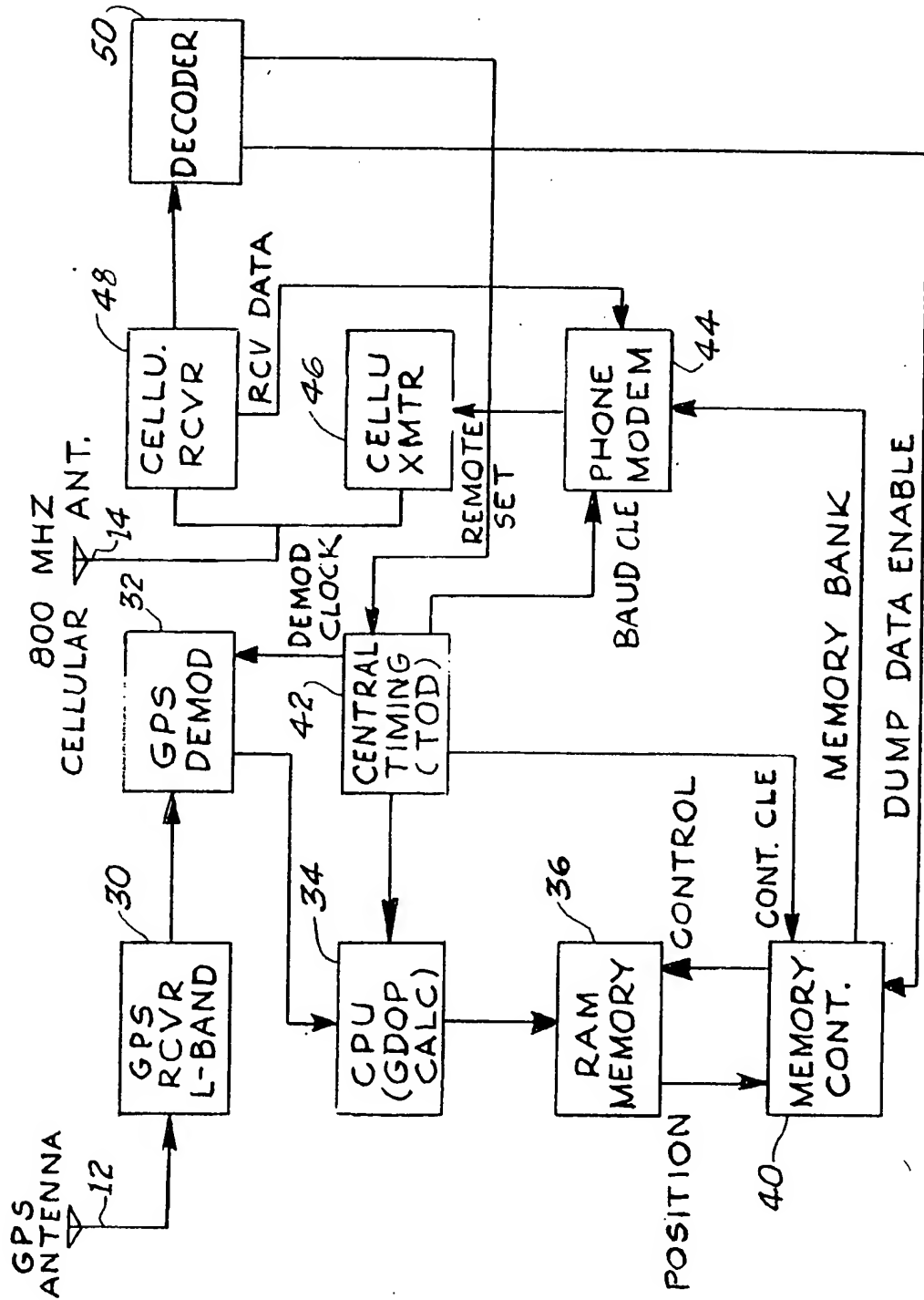


FIG. 2.



—REMOTE UNIT— FIG. 4.

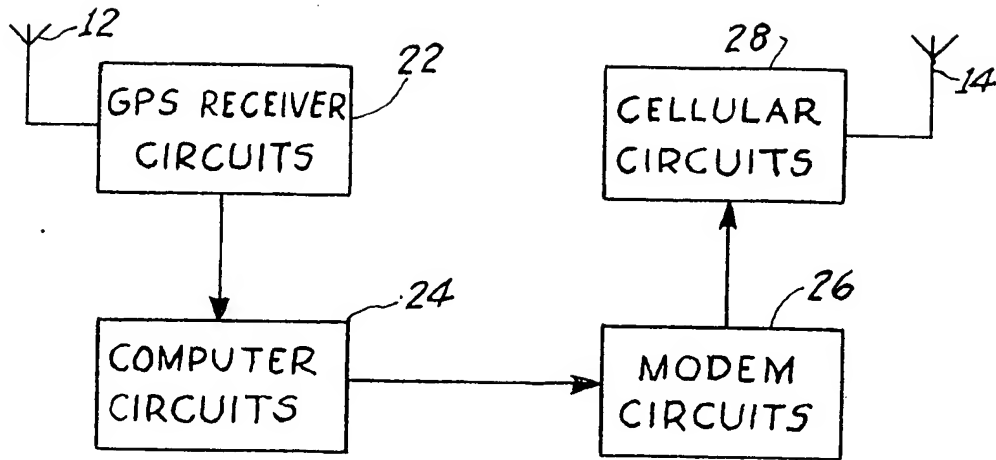


FIG. 3.

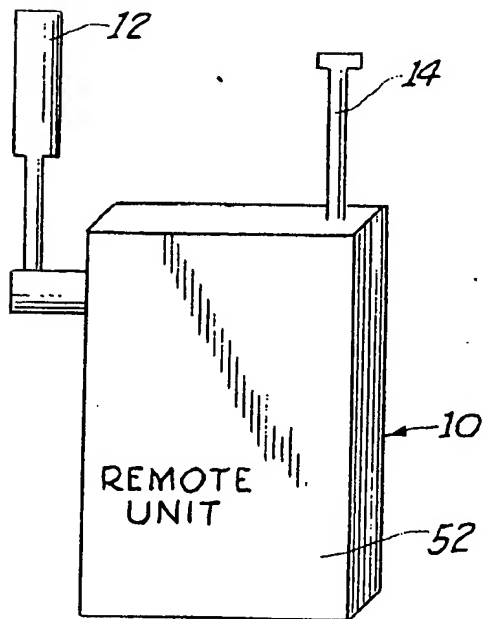


FIG. 5.



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## EUROPEAN SEARCH REPORT

Application Number

EP 91 30 7697

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	EP-A-0 242 099 (ADVANCED STRATEGIES INC.) * page 2, line 4-5 * * page 2, line 42 - page 3, line 10 * * page 3, line 34 - page 5, line 50; figures 1-4 *	1-4	G01S5/00
A	WO-A-8 912 835 (BROWN) * page 2, line 10 - page 5, line 7 * * page 6, line 1 - page 8, line 9 * * page 8, line 36 - page 9, line 15; figures 1-3 *	1-4	
A	EP-A-0 379 198 (SHARP KABUSHIKI KAISHA) * the whole document *	1-4	
A	IEE PROCEEDINGS PART F: COMMUNICATIONS, RADAR AND SIGNAL PROCESSING, Vol.127, No.2, April 1980 Stevenage, GB, BLAIR ET AL.: "Receivers for the NAVSTAR global positioning system", pages163-167 * the whole document *	1-3	
E	US-A-5 043 736 (DARNELL ET AL) * the whole document *	1-4	TECHNICAL FIELDS SEARCHED (Int. Cl.5)  G01S H04Q
The present search report has been drawn up for all claims			
Place of search THE HAGUE	Date of completion of the search 07 APRIL 1992	Examiner HAFFNER R, D, R.	
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background : non-written disclosure P : intermediate document			